CLAIMS

1. An optical semiconductor device comprising:

a laser element;

an emitted beam dividing portion for dividing an emitted light beam from the laser element into a plurality of light beams;

a reflected beam dividing portion for dividing a reflected light beam from an information recording medium into light beams in different focused states;

servo-signal-detecting photodetector elements for receiving the reflected light beams obtained by the division by the reflected beam dividing portion in a defocused state;

a first diffraction grating that is provided in the emitted beam dividing portion and that diffracts the reflected light beam having passed through the reflected beam dividing portion; and

a signal-detecting photodetector element for receiving reflected light beams having been subjected to the diffraction by the first diffraction grating.

2. The optical semiconductor device according to claim 1, wherein the reflected light beam from the information recording medium that is diffracted by the first diffraction grating substantially focuses on a surface of the signal-detecting photodetector element.

3. The optical semiconductor device according to claim 1, wherein two diffracted light beams of the same order diffraction by the first diffraction grating are subjected to the diffraction with different diffraction efficiencies, and the diffracted light beam having the higher diffraction efficiency is received by the signal-detecting photodetector element.

4. The optical semiconductor device according to claim 3, wherein each grating in the first diffraction grating is of an inclined type having a step-like cross-sectional shape or a triangular cross-sectional shape.

5. The optical semiconductor device according to claim 1 or 2, wherein the first diffraction grating is composed of gratings, each of which is in a curved line form.

ENGLISH TRANSLATION OF AMENDMENT UNDER ARTICLE 19

6. The optical semiconductor device according to claim 1 or 2, wherein the first diffraction grating is composed of a plurality of diffraction grating regions having the same diffraction efficiency.

7. The optical semiconductor device according to claim 1 or 2, wherein the first diffraction grating is composed of at least two diffraction grating regions that differ from each other in a direction in which gratings are arranged.

8. The optical semiconductor device according to claim 1 or 2, wherein the first diffraction grating is composed of diffraction grating regions having the same grating periodic interval.

9. The optical semiconductor device according to claim 1 or 2, wherein the first diffraction grating is composed of a plurality of diffraction grating regions that divide a spot of the reflected light beam equally.

10. (cancelled)

11. The optical semiconductor device according to claim 1, wherein:

when the emitted beam dividing portion is positioned on an optical axis extending between an emission point of the laser element and a main spot formed via an objective lens on the information recording medium, the reflected light beam from the foregoing information recording medium entering a region satisfying a formula shown below is divided so as to be collected on the signal-detecting photodetector element:

$r \leq d \times \tan(\sin^{-1}(NA))$

where:

d represents an air-equivalent distance from the emission point of the laser element to the emitted beam dividing portion;

NA represents a numerical aperture of the objective lens; and

r represents a distance from a point at which the optical axis and the emitted beam dividing portion cross each other on the emitted beam dividing portion.

12. An optical element comprising:

a first optical element that is provided on one surface of a transparent member and that includes first and second diffraction gratings; and

a second optical element that is provided on the other surface of the transparent member and that divides a reflected light beam into light beams in different focused states,

wherein the first and second diffraction gratings are juxtaposed in a first direction, and gratings of the first diffraction grating are arranged in a direction different from the first direction.

13. The optical element according to claim 12, wherein the first diffraction grating is of an inclined type having a step-like cross-sectional shape or a triangular cross-sectional shape.

14. The optical element according to claim 12, wherein the first diffraction grating is composed of gratings each of which is in a curved line form.

15. The optical element according to claim 12, wherein the first diffraction grating is composed of at least two diffraction grating regions that differ from each other in a direction in which gratings are arranged.

16.(amended) An optical information processing device comprising:

a laser element;

an emitted beam dividing portion for dividing an emitted light beam from the laser element into a plurality of light beams;

an optical system for guiding the light beams obtained by the division by the emitted beam dividing portion to an information recording medium;

a reflected beam dividing portion for dividing a reflected light beam from the information recording medium into light beams in different focused states;

servo-signal-detecting photodetector elements for receiving the reflected light beams obtained by the division by the reflected beam dividing portion in a defocused state;

a first diffraction grating that is provided in the emitted beam dividing portion and that diffracts the reflected light beam having passed through the reflected beam dividing portion; and

a signal-detecting photodetector element for receiving reflected light beams having been subjected to the diffraction by the first diffraction grating.

17. The optical information processing device according to claim 16, wherein the signal-detecting photodetector element has a light-receiving area smaller than a light-receiving area of the servo-signal-detecting photodetector elements.

18. The optical semiconductor device according to claim 1, wherein:

a pair of the servo-signal-detecting photodetector elements are arranged symmetrically with respect to an optical axis; and

the signal-detecting photodetector element is arranged at a shorter distance from the optical axis than the servo-signal-detecting photodetector elements and has a light-receiving area smaller than a light-receiving area of the servo-signal-detecting photodetector elements,

wherein the pair of the servo-signal-detecting photodetector elements and the signal-detecting photodetector element are integrated.

19. The optical semiconductor device according to claim 18, wherein the signal-detecting photodetector element is positioned closer to one of the servo-signal-detecting photodetector elements.

20. The optical semiconductor device according to claim 18, wherein the

signal-detecting photodetector element is provided in substantially a same plane as the emission point.

21. The optical semiconductor device according to claim 18, wherein the signal-detecting photodetector element is divided into a plurality of detecting sections having substantially equal areas.